

Soil components in heterogeneous impact glass in Martian meteorite EETA79001

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Martian soil composition can illuminate past and ongoing near-surface processes such as impact gardening [2] and hydrothermal and volcanic activity [3,4]. Though the Mars Exploration Rovers (MER) have analyzed the major-element composition of Martian soils, no soil samples have been returned to Earth for detailed chemical analysis. Rao et al. [1] suggested that Martian meteorite EETA79001 contains melted Martian soil in its impact glass (Lithology C) based on sulfur enrichment of Lithology C relative to the meteorite's basaltic lithologies (A and B) [1,2]. If true, it may be possible to extract detailed soil chemical analyses using this meteoritic sample.

We conducted high-resolution (~0.3 $\mu\text{m}/\text{pixel}$) element mapping of Lithology C in thin section EETA79001.18 by energy dispersive spectrometry (EDS). We use these data for principal component analysis (PCA).

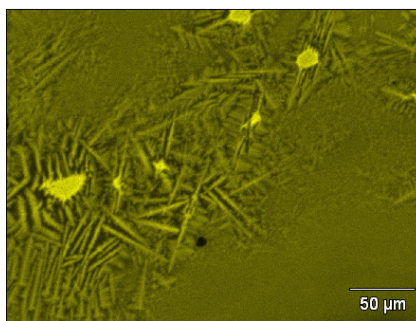


Fig. 1: Magnesium map of EETA79001 Lithology C. Brighter yellow colors correspond to higher Mg contents of pixel. Yellow, sub-angular relict olivine and elongate quench crystals are set in a glassy matrix.

Though visually glassy, EETA79001 Lithology C is heterogeneous. PCA identifies several significant components that may originate either in the basalt or in the soil, but one component with strongly positive eigenvectors for K and Cl likely represents a soluble soil component originating by hydrothermal or evaporitic processes.

We are conducting quantitative beam analysis of the glass to determine minor and trace elements, including halogens. We will compare these to compositions of EETA79001 basalt [5,6] and to MER rock and soil compositions [7,8,9] to constrain the origin of components in EETA79001 Lithology C.

- [1] Rao, M.N. et al. (1999) *GRL*, 26, 3265-3268. [2] Rao, M.N., and McKay, D.S. (2002) 65th Annual Meeting of the Met. Soc., Abstract # 5042. [3] Newsom, H.E. and Haggerty (1999) *JGR*, 104, 8717-8728. [4] Sutton, S.R. et al. (2002) LPSC XXXIII, Abstract #1278. [5] Mellin, M.J. et al. (2007) LPSC XXXVIII, Abstract #2324. [6] Mellin, M.J. et al. (2008) LPSC XXXIX, Abstract #2150. [7] McSween, H.Y. et al. (2004) *Science* 305, 842-845. [8] Gellert, R. et al. (2004) *Science* 305, 829-832. [9] Rieder, R., et al. (2004) *Science* 306, 1746-1749.